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TROUBLESHOOTING in the TR

PAGE 5

DATA CENTER PAGE 11

Enclosures here, there and everywhere

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CONTENTS

DECEMBER 2016
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ABOUT THE COVER
Among the innovations that improve troubleshooting is the development of the LabelLink mobile app. Photo provided by Brother Mobile Solutions.
SEE ARTICLE ON PAGE 5.

FEATURES

DEPARTMENTS

Cabling Installation & Maintenance

Group Publisher Alan Bergstein
(603)-891-9447; alanb@pennwell.com
Chief Editor Patrick McLaughlin
(603) 891-9222; patrick@pennwell.com
Senior Editor Matt Vincent
(603) 891-9262; mattv@pennwell.com
Art Director Cindy Chamberlin
Production Director Mari Rodriguez
Senior Illustrator Dan Rodd
Marketing Manager Joni Montemagno
Audience Development Manager Stephanie O'Shea
Ad Traffic Manager Glenda van Duyne

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EDITORIAL OFFICES
Cabling Installation & Maintenance
61 Spit Brook Road, Suite 401, Nashua, NH 03060
Tel: (603) 891-0123, Fax: (603) 891-9245
www.cablinginstall.com

CORPORATE OFFICERS
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FOR SUBSCRIPTION INQUIRIES:
Tel: (847) 559-7330; Fax: (847) 763-9607
www.cim-subscribe.com; e-mail: cim@halldata.com

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Cabling Installation & Maintenance® (ISSN 1073-3108), Volume 24, No. 12. *Cabling Installation & Maintenance* is published 12 times a year, monthly by PennWell® Corporation, 1421 S. Sheridan, Tulsa, OK 74112. Periodicals postage paid at Tulsa, OK 74112 and at additional mailing offices. **SUBSCRIPTION PRICES:** USA $74 1yr., $110 2 yr.; Canada/Mexico $86 1 yr., $130 2 yr.; International $108 1 yr., $160 2 yr. **POSTMASTER:** Send address corrections to Cabling Installation & Maintenance, P.O. Box 3425, Northbrook, IL 60065-3425. Cabling Installation & Maintenance is a registered trademark. © PennWell Corporation 2016. All rights reserved. Reproduction in whole or in part without permission is prohibited. Permission, however, is granted for employees of corporations licensed under the Annual Authorization Service offered by the Copyright Clearance Center Inc. (CCC), 222 Rosewood Drive, Danvers, Mass. 01923, or by calling CCC's Customer Relations Department at 978-750-8400 prior to copying. We make portions of our subscriber list available to carefully screened companies that offer products and services that may be important for your work. If you do not want to receive those offers and/or information via direct mail, please let us know by contacting us at List Services *Cabling Installation & Maintenance*, 61 Spit Brook Rd, Suite 401, Nashua, NH 03060. Printed in the USA. GST No. 126813153. Publications Mail Agreement no. 1421727.

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The year that cable changed forever?

PATRICK McLAUGHLIN
patrick@pennwell.com

With 2016 almost completely in the rearview mirror, I look at the reflection and it occurs to me that, as years go, this has been a pretty active one in the realm of technological, business, and standards developments having to do with cable. Here are the highlights in my mind.

Twisted-pair cable has become a building system. I'm talking mostly about the cabling's ability to deliver direct current power. Sure, it has been doing so for more than a decade. But 2016 has been the year in which this capability took on critical importance. With Type 3 and Type 4 powering soon to be finalized via the IEEE's 802.3bt spec, combined with other standardized and some proprietary powering technologies, twisted-pair cabling can do a lot more for building owners and tenants.

We may have been jolted out of our seats. To quote somebody (maybe Voltaire, maybe SpiderMan's Uncle Ben, I really don't know), with great power comes great responsibility. The ability to send more and more wattage over twisted-pair cabling brought with it significant scrutiny over what happens to the cable, in the way of heat rise, under numerous conditions. Table 725.144 in the 2017 *National Electrical Code* has become the embodiment of this scrutiny. And now to paraphrase Sir Winston Churchill, I don't think 725.144 is the beginning of the end. But it is, perhaps, the end of the beginning, of how cabling professionals implement remote-powering systems using twisted-pair cabling.

Fiber-optic cabling had an interesting year too. OM5, wideband multimode fiber (WBMMF), achieved standardization in 2016. This technology can change the game, if users want it to. As I mention elsewhere in this issue, even though the IEEE chose not to include a WBMMF/short-wave WDM option for 100G in the 802.3cd effort, we're likely to see the market develop an end-to-end 100G system on duplex WBMMF. I, for one, am eager to see how it all unfolds.

And singlemode. We'll cover this in greater depth in future issues, but long-wavelength optical systems supported by singlemode fiber have been deployed more frequently in "enterprise-class" data centers. For years a generally accepted truth was that long-wave/singlemode systems were the stuff of hyperscale and cloud data centers, while short-wave/multimode dominated elsewhere. That truth is not entirely true anymore. We'll dig deeper into this in 2017.

Will 2016 go down as the year that cable changed forever? It may very well go down as the year that forever changed how we specify, buy, install and use it.

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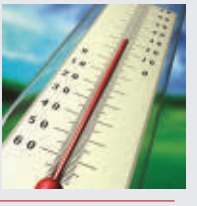

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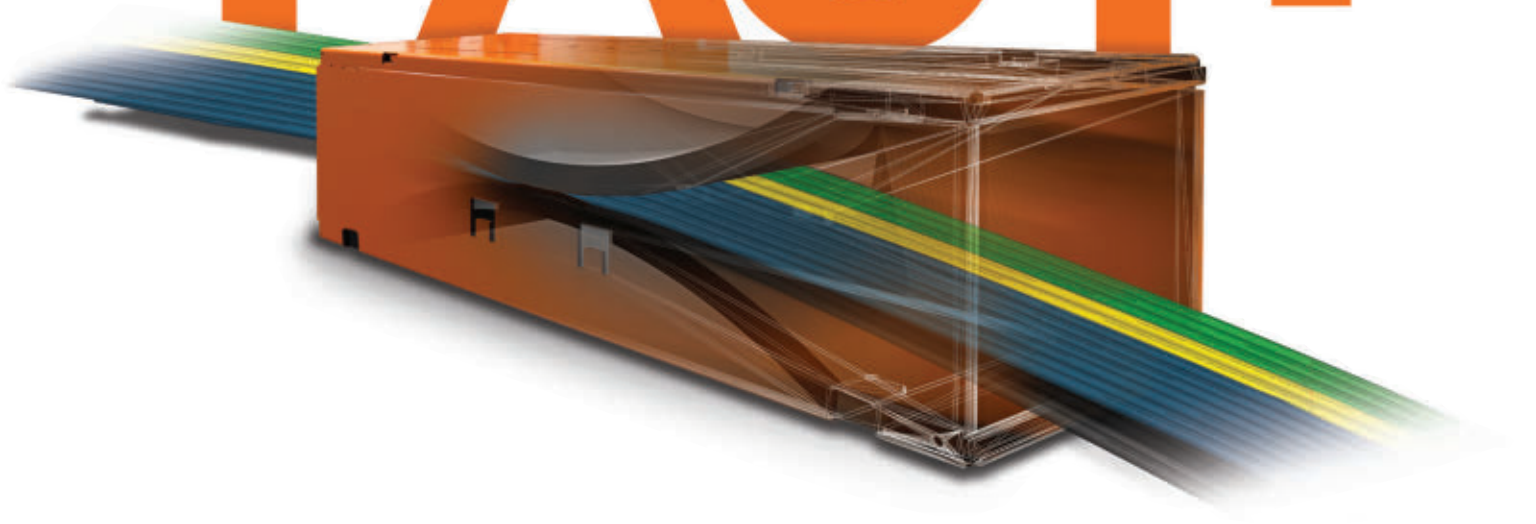

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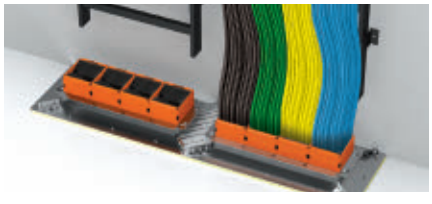

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Handheld tools advance to ease the troubleshooting process

Finding and resolving faults in installed cabling links no longer has to be a hunt-and-peck process.

BY PATRICK MCLAUGHLIN

Ideal Networks' VDV II Pro uses time domain reflectometry to obtain accurate measurements. The tool also offers built-in network detection to help identify connection issues caused by a media service such as ISDN, PBX or PoE rather than a cable fault.

A combination of enhancements to existing products and the introduction of new products has made the task of troubleshooting installed cabling systems less arduous than it historically has been. This article looks at a few recent technological developments that are examples.

In an article published to the cablinginstall.com website in late September, Softing described the purpose, capabilities, and price variations among different cabling-tester types. Within that article, titled "Do I really need different cable testing devices," Softing noted, "Higher speeds are the result of technological refinements that increase various interactions in the physical and data layers of a cable link over shorter periods of time in the same amount of space. The complex interweave of materials, signal and math is the primary reason devices for testing LAN links have become so sophisticated."

The article then explained, "One of the simplest cable tests, called wire mapping, sends a signal down the link to see if anything is wrong, broken or missing. A method called time domain reflectometry measures the speed of the signal and maps the channel topology, precisely locating the number of possible faults. Sometimes called TDRs or verifiers, these wire mapping devices are the equivalent of a pocket knife and should be hanging from every technician's belt. A somewhat more useful foundational cable testing device will be able to detect Power over Ethernet (PoE) and capture any networked phones, cameras or other low-voltage devices in the wire map."

Verifiers and qualifiers

Tim Widdershoven, global marketing manager at Ideal Networks (idealnetworks.net), recently commented about wire map testing and the tools used to conduct it. He noted, "Installers have been using LED cable verifiers, or blink boxes, to conduct wire map tests for years as they are easy to use and suitable for identifying common faults. However, with today's more complex cable infrastructure, LCD verifiers are the best choice for the majority of installers and can help to improve efficiency."

Unlike LED verifiers, which require a user to decode a sequence of blinking lights to identify a cabling fault, the display panel on an LCD verifier has "intuitive graphics to provide far more comprehensive details on cabling faults, allowing for faster repair," Ideal Networks noted. "LCD verifiers can display information such as cable length, distance to opens or shorts, crossovers, split pairs, connection speed on live networks, analog-versus-digital phone service and PoE status."

The company and Widdershoven made these comments within the context of discussing Ideal's VDV II product line, which includes three models: VDV II, VDV II Plus and VDV II Pro. "VDV II Pro uses TDR to obtain more-accurate measurements more quickly," the company explained. It also offers built-in network detection to help identify connection issues that are caused by a media service such as ISDN, PBX or PoE,

rather than a cable fault.

In its online article, Softing took the conversation up the network stack a bit. "The next step up in verifiers enables the technician to troubleshoot the network by identifying specific faults in both the physical and link layers in a channel. In addition to broken or split wires, bad connections or other issues associated with the signal itself, the tester will perform a network discovery that tests the data protocols at each link to make sure all devices on the network are properly identifying one another.

"Whether you are installing a new run or troubleshooting a faulty one, someone is going to need to test both the physical and link layers and prove that the network is operating to specifications," Softing continued. "That takes us to a considerably higher level of testing, typically called qualification or transmission testing … As a practical matter, certification [to TIA and/or ISO/IEC cabling specifications] only happens after everything has been installed, fixed and tested. This leaves a lot of situations short of certification where the testing and reporting capabilities of a certifier could come in handy. That is the space occupied by qualifiers."

Softing offers the NetXpert qualification test set, which the company explains "does all the troubleshooting of cable/network testers with one very important addition: It can verify Gigabit Ethernet operation compliant with the IEEE 802.3ab standard. It does this through bit error rate test (BERT), a form of data transmission testing that sends 1 Gbit/sec, counts the errors, then issues a pass/fail. While distinct from certification, a BERT pass essentially proves the speed of a cable channel is up to standard."

The company further noted that the cost of a qualifier typically is less than one-third that of a certifier, and therefore "it makes sense for every cabling crew to pack a network qualifier. On the other hand, at about twice the cost of a cable verifier it's overkill to have everyone using them for routine wire mapping and troubleshooting. Every cabling contractor location should have at least one certifier under a service contract plus one backup. Every crew needs to have a qualifier available to test the fix. Every technician should be carrying a cable verifier, whether they are part of a cabling contractor crew or a facilities management team."

Using LabelLink, a technician inside a telecommunications room can download cable identifiers from the LinkWare Live app into the Brother P-Touch Edge PT-E550W industrial labeling tool, which is used to create and print labels.

Fiber troubleshooting

The testing of installed fiber-optic cabling systems is divided into methods called Tier 1 and Tier 2. In a white paper titled "The Rise of Tier 2 Testing," Viavi Solutions explains that, in essence, Tier 1 tests a fiber link for length, polarity, and link loss. "While Tier 1 tests can identify problems in terms of pass or fail, they cannot determine the root cause or location of the problem," Viavi says. "Tier 2 testing is used to pinpoint root-cause locations and the amount of loss, ORL [optical return loss], or reflectance from each problem contributor. The OTDR is used to perform Tier 2 testing.

"It's important to understand that Tier 2 testing does not replace Tier 1," Viavi continues. "It is performed selectively in addition to Tier 1 testing under specific conditions and situations. Tier 2 testing provides a deeper level of link visibility, unlike any other fiber infrastructure tests."

The paper focuses to some extent on the use and functionality of the OTDR, optical time-domain reflectometer: "The OTDR provides the unique ability to visually see and map the link and any passive events over its length," Viavi explains. "The OTDR sends an optical test pulse over the fiber. Similar to radar, a small amount of this energy is scattered, or reflected, some of which returns to a detector in the OTDR. This reflected energy is mapped based on its round-trip travel time converted to distance, based on the speed of light in optical glass.

"OTDRs have a reputation of being complicated and intimidating for network technicians. Learning to read a trace might look easy to more-experienced users, but it can be complex, especially when various factors cause confusing results. Setting up OTDRs to test accurately also requires knowledge and experience. Knowing what you are testing, and translating that knowledge to the right test setup, can take years to master."

However, the paper notes, new advances have simplified OTDR testing. Specifically, preconfigured instrument setups, easier-to-read schematic test results, and better documentation are characteristic of the newest-generation OTDRs and make the task of Tier 2 testing easier to accomplish than it traditionally has been. "Much effort has gone into the OTDR user interface design, making the tool much easier to use," Viavi notes. "Technicians can operate many modern OTDRs easily with very

little training because of new software enhancements."

Fluke Networks added capability to its OptiFiber Pro OTDR that gives the unit the ability to test two separate fiber links in both directions from one end in a single test. "With SmartLoop, users no longer need to walk the OTDR to the far end of the link to perform bidirectional tests, helping contractors squeeze more profitability out of each project," the company explained. "Experts and standard bodies know that bidirectional averaging is the only accurate way to perform OTDR measurements. Without it, there is a risk of false failures and wasting time troubleshooting problems that aren't there. But customers are reluctant to do it because of the time and complexity. The new SmartLoop technology makes it easy and fast to perform this crucial function."

Linking labeling

In addition to developing technology innovations that simplify or improve the testing process, Fluke Networks recently collaborated with cable-labeling producer Brother Mobile Solutions to create LabelLink, a mobile app-based jobsite workflow tool that allows the printing of labels directly form data generated as part of the testing process. LabelLink is built on Fluke Networks' LinkWare Live cloud-based storage and management system. "The application effectively marries Fluke's LinkWare Live cloud technology with Brother's PT-E550W WiFi industrial labeling tool to perform multiple functions with a single entry of cable identifier data," Brother Mobile Solutions says.

"Adhering to industry standards and best practices in datacom network planning and design, as well as installation and identification of the physical layer infrastructure, calls for precise and accurate labeling of all cabling and connectivity components," the company continued. "The larger and more complex the project, the more specific, complete and consistent component labeling must be. For this reason, close coordination is needed between system designers, testers and their installers to ensure that the project's execution at the jobsite precisely matches the design plan."

Brother explains that the LabelLink application works as follows: 1) In the office, the project manager uses CAD to plan the network infrastructure, then uploads cable ID and component identifiers to LinkWare Live; 2) The project manager can use LinkWare Live to define detailed test settings for the job; 3) Technicians download and install the LabelLink app on their smartphones; 4) On the jobsite, the contractor

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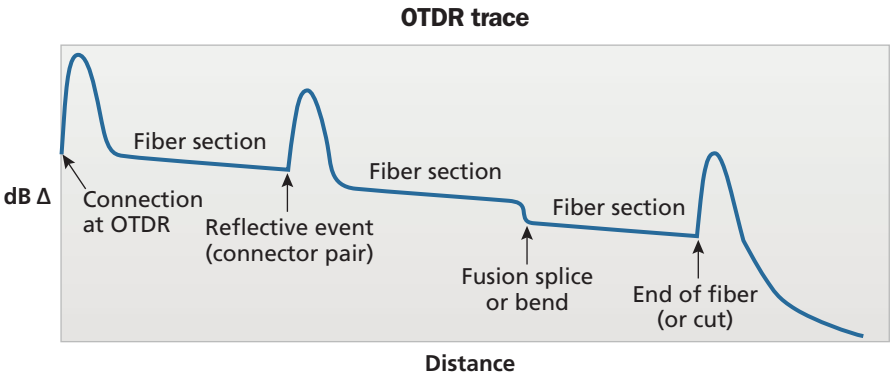

Taken from Viavi Solutions' white paper "The Rise of Tier 2 Testing," this illustration is an example of the dynamic link map that an OTDR displays. The OTDR displays the link as a line sloping downward from left to right. Each fiber section is separated by events along the fiber. Reading OTDR traces is traditionally regarded as a challenging task. New software enhancements, however, enable OTDRs to generate preformatted reports with detailed information about the fiber link.

or technician uses their smartphone to download cable identifiers from LinkWare Live into their Brother PT-E550W labeling tool, which is used to create labels; 5) Also on the jobsite, the contractor or technician downloads the same identifiers and testing limits into the Fluke Versiv Cabling Certification System, performs the tests, and uploads testing results for each identifier to LinkWare Live.

Brother further explains, "Using a single, centralized database removes multiple additional steps, and eliminates the chance of transcription errors and confusion, and makes it much harder to miss testing links or test them multiple times. It can also prevent delays when experts are called to the site to make sure tests are set up properly. This is especially valuable on large jobs, where multiple technicians are using multiple testers and labelers, and the chance of mistakes is greatly increased."

With the product enhancements and introductions described in this article, test technicians have more and more-efficient means to identify, locate, and in some cases even prevent faults that degrade cabling-link performance. ◆

Patrick McLaughlin *is our chief editor.*

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The several flavors of 100-Gbit optical Ethernet

Specifications from the IEEE define the transmission of 100-Gbit/sec optical signals.

BY PATRICK MCLAUGHLIN

More than 10 years ago the path toward 100-Gbit/sec Ethernet transmission began within the Institute of Electrical and Electronics Engineers (IEEE), and in that time the IEEE's 802.3 Working Group has developed multiple specifications for 100G transmission. This article will cover existing 100G specifications as well as current IEEE 802.3 activities to establish additional standards. It focuses on optical technologies.

The 802.3ba standard, approved in 2010, establishes an architecture for both 40- and 100-Gbit Ethernet. Shortly after the standard's approval in June 2010, the Ethernet Alliance published a technical paper summarizing the new set of specifications. Within that paper is a section titled "Physical Media Dependent (PMD)," which spells out physical layer specifications. The paper explains that the 100GBase-SR10 PMD is "based on 850-nm technology and supports transmission over at least 100-meter OM3 parallel fibers and at least 150-meter OM4 parallel fibers." The effective rate per lane is 10 Gbits/sec. As such, "the 100GBase-SR10 PMD supports the transmission of 100 Gigabit Ethernet over a parallel fiber medium consisting of 10 parallel OM3 fibers in each direction."

100GBase-LR4 is based on 1310-nm dense wave-division multiplexing (WDM) technology. It supports transmission over at least 10 kilometers on singlemode fiber. "The effective data rate per lambda is 25 gigabits per second … In this way, the 100GBase-LR4 PMD supports transmission of 100 Gigabit Ethernet over four wavelengths on each singlemode fiber in each direction," the Ethernet Alliance paper explains.

100GBase-ER4 is also based on 1310-nm WDM technology and supports transmission over at least 40 kilometers on singlemode fiber.

Nearly five years after 802.3ba was published, the IEEE finalized the 802.3bm specifications. In its Standards Informant Blog, Siemon provides detail on the "bm" specifications, including this insight: "The rapid growth of server, network, and internet traffic drove the need for higher data rate, higher density, and lower cost optical fiber Ethernet solutions, especially in data centers. The 100-Gbit/sec optical fiber Ethernet applications specified in IEEE 802.3ba include a 10-lane electrical interface (20 fibers total) for operation over multimode optical fiber cabling (10GBase-SR10). Advances in technology supported the specification of a new multimode 100-Gbit/sec physical layer (PHY) specification with reduced lane count, which will simplify upgrades from 40GBase-SR4 using the existing cabling plant."

The Standards Informant adds one of the new PHY specifications in 802.3bm is 100GBase-SR4, which specifies 100-Gbit/sec transmission using a four-lane electrical interface (8 fibers total) for operation over multimode optical fiber cabling with reach up to at least 100 meters.

When the IEEE announced the availability of 802.3bm, David Law, the 802.3 Ethernet Working Group's chair, commented, "IEEE 802.3bm demonstrates how IEEE 802.3 is taking a forward-thinking approach to stay ahead of global demands on Ethernet networking, which paves the way for innovation in devices and services."

Dan Dove, chair of the 802.3bm Task Force, added, "Significantly higher Ethernet performance, capacity and reach in optical networking are needed especially inside and among data centers across metropolitan areas, given the ongoing proliferation of smartphones, video-on-demand, cloud computing and other bandwidth-intensive applications such as the Internet of Things. The project to develop IEEE 802.3bm addressed these market needs through a globally open, collaborative effort that drew contributions from a broad spectrum of engineers and end users across the Ethernet ecosystem."

Later in 2015, 802.3 formed three study groups, which are exploring the development of standards for 25-, 50-, and 100- and 200-Gbit/sec Ethernet. Siemon also addressed this development in its Standards Informant, describing the efforts to develop IEEE 802.3cd. The Standards Informant forecasts a publication timeframe of approximately September 2018. Within the blog, Siemon notes, "Server interconnects in the data center, which represent the highest number of equipment connections, require cost-effective solutions. Advances in cost-optimized single-lane solutions and higher-speed multilane transmission solutions warrant reevaluating the signaling technology for 50-Gbit/sec and 100-Gbit/sec Ethernet.

"In addition, servers virtualizing more applications are driving additional bandwidth into the network and network uplinks need to progress to higher speeds to match server speeds. 200-Gbit/sec can support network infrastructure and oversubscription rates similar to 40- and 100-Gbit/sec Ethernet as servers migrate from 25 Gbits/sec to 50 Gbits/sec, while also enabling data center fabric topology."

Among the PHY specifications in this amendment to 802.3 are the following.

- 100GBase-DR: 100-Gbit/sec serial transmission over one wavelength (2 fibers total) for operation over single-mode optical fiber cabling with reach up to at least 500 meters
- 100GBase-SR2: 100-Gbit/sec transmission over two lanes (4 fibers total) for operation over multimode optical fiber cabling with reach up to at least 100 meters

Of note concerning the IEEE 802.3cd specification is that the task force did not include an iteration that calls for duplex multimode operation of 100-Gbit/sec per fiber using short-wave WDM. That transmission would have used wideband multimode fiber (WBMMF), which recently obtained the nomenclature OM5. In a web seminar hosted by *Cabling Installation & Maintenance* on October 27, OFS's John Kamino presented an update on WBMMF standardization. Within that presentation Kamino explained that the 802.3cd task force did not approve the inclusion of WBMMF in the standard. He expressed the opinion that, although there are no current plans to include WBMMF in an IEEE standard, there is likely to be some form of this technology developed in the market.

We will continue to follow standards and technology developments, and will keep you updated. ◆

Patrick McLaughlin *is our chief editor.*

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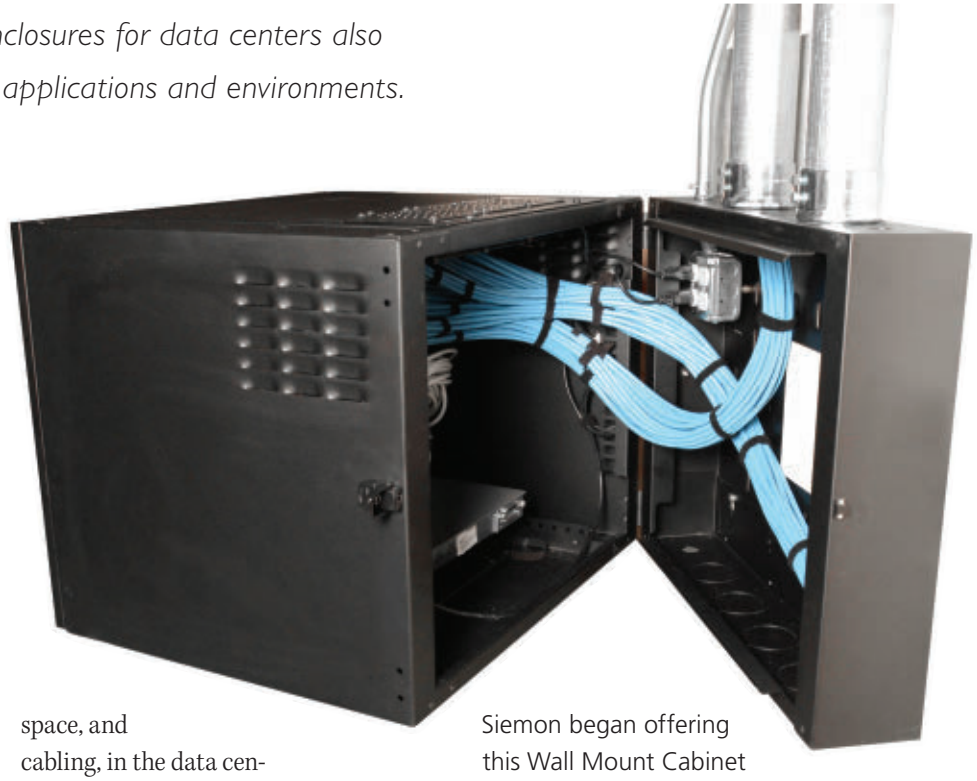
Equipment enclosures are versatile in many environments

Suppliers of high-end enclosures for data centers also offer products for other applications and environments.

BY PATRICK MCLAUGHLIN



The data center is an ecosystem and in some ways a world in and of itself, as we have reported and opined in several ways over the years. The communications network within a data center is more demanding, in just about every aspect, than a communications network in any other environment. As such, the equipment that houses and protects networking equipment in a data center must exhibit characteristics that are not necessary in other networking environments.

Equipment enclosures are an example. This article will look at enclosure products available from providers that serve the data center environment as well as other environments, emphasizing the different attributes and characteristics of these products when they are aimed at different computing environments. Specifically, several providers of data center enclosures recently debuted products designed for industrial-networking environments.

Data center and industrial networking

For example, Siemon (www.siemon.com) offers the VersaPod series of data center cabinets, whose value proposition includes the ability to efficiently manage space, and cabling, in the data center. "By leveraging the vertical space between bayed cabinets and at the end of row for zero-U patching, cable management and power distribution, VersaPod frees critical horizontal equipment mounting space for equipment and provides a dedicated, high-capacity and easily managed cabling zone," the company explains. Among VersaPod's features are dedicated cabling pathways, cable access points, vertical cable-management trays, cable-management fingers, zero-U vertical cable management channels, and end-of-row cable managers. The product line also accommodates thermal management via features including vertical exhaust ducts, high-flow doors, and rear-cooling doors among others.

Siemon began offering this Wall Mount Cabinet in April. The company says the cabinet saves floor space while providing a cost-effective means to secure and protect network equipment from dust, tampering and other hazards in a range of applications.

"Physical space is one of the most important considerations in the data center infrastructure," Siemon points out. "How will you fit everything you need today? What happens when you have to add more tomorrow?" VersaPod is the company's answer to those questions.

Stepping outside the data center to the different-but-no-less-important demands of an industrial networking environment, Siemon recently introduced

The Ortronics Mighty Mo Wall Mount Cabinet series from Legrand features cable management to support and organize cables, ensure proper cable management for minimum distortion and maximize network performance, according to the company.

a NEMA Type 1 wall-mount cabinet that the company says saves users space as well as money. Brought to market in April, the Wall Mount Cabinet "saves valuable floor space while providing a cost-effective means to secure and protect network equipment from dust, tampering and other hazards in a wide range of applications."

The cabinet is an EIA/ECA-310-compliant NEMA Type 1 enclosure "that features fully integrated and adjustable vertical cable management for properly routing patch cords and cables, and an adjustable mounting rail system to support any standard 19-inch rack-mountable equipment," Siemon said when introducing it. "With a right- or left-hinged locking back plate design that offers easy rear access to equipment and wiring, it is ideal as a mini telecommunications room or for remote network distribution and consolidation points in open, unprotected spaces such as warehouses, retail facilities and schools."

It is compliant with UL 60950 safety standards and has a load capacity of 91 kilograms (200 pounds). It is available in 12U, 18U and 24U sizes and in depths of 24 or 30 inches. The front door can be Plexiglas, solid, or vented.

From Legrand's Ortronics brand (www.legrand.us/ortronics), the LX cabinet system "is a comprehensive platform designed to address the most-demanding enterprise data center applications with superior modular cable management and scalable airflow management, simplified access and engineered integration with copper and fiber connectivity to maximize network uptime," the company says. "Innovative cable management in the LX cabinet system reduces tension at the connection point, while supporting the weight of the cables to protect connection," Legrand notes. "The LX cabinet platform allows for moves, adds and changes, creating a system that is easy to use and saves valuable time. Tool-less features, including air dams, vertical cable managers, all panels, overhead mounting brackets and security hinges allow for quick changes as well as reduced time on installation and removal.

"To maximize density, the LX offers up to 52U and front-to-rear cable managers," Legrand continues. "The cabinet has the ability to manage 10G copper applications and offers passive and active cooling solutions with capabilities up to 30 kw, demonstrating optimized rack unit space."

For environments other than data centers, Legrand offers the Mighty Mo Wall Mount Cabinet series, which the company says features "cable management to support and organize cables, ensuring proper cable management for minimum distortion and maximum network performance." The cabinet can be mounted to open to the left or to the right, and a locking center section swings out to provide access to the equipment housed within it.

The Mighty Mo Wall Mount Cabinet includes a pair of adjustable 12-24 EIA mounting rails. Fifty-cfm cooling fans are available to further protect active equipment, Legrand adds. Cable knockout plates are standard on the cabinet's bottom rear, and brush cable entry plates are standard on the top rear. A three-inch hole with cap is standard on the top and bottom rear.

Going new places

Chatsworth Products Inc. (CPI; www.chatsworth.com) offers a number of enclosure product lines for data center networks, including the TeraFrame family, which the company describes as "highly configurable." The TeraFrame series supports Chatsworth's Passive Cooling Solutions as well as its aisle-containment solutions. They have a static load rating of up to 1360 kg (3000 pounds), with 19-inch rack-mount rails as well as a "broad selection of thermal, cable and power management and distribution accessories," the company says.

The TeraFrame family comprises three series of cabinets: F-Series TeraFrame Gen 3; F-Series TeraFrame HD; and N-Series TeraFrame Gen 3.

In October CPI introduced the RMR Industrial Enclosures, which it characterizes as "advanced storage solutions engineered with cutting-edge sealing technology that are certified to meet

NEMA 12 and IEC IP 55 protection ratings, and feature extensive equipment mounting options."

Chatsworth pronounces the RMR product line "armor," indicative of the cabinets' toughness in unfriendly environments. The company explains, "RMR enclosures are UL Type 12 Listed and IP 55 Classified, which verify that equipment is protected from the intrusion of foreign objects such as dirt, dust, lint and fibers, as well as noncorrosive liquid ingress such as light dripping and splashing."

Chatsworth Products Inc. describes its new RMR Industrial Enclosures as advanced storage solutions engineered with cutting-edge sealing technology that meet NEMA 12 and IEC IP 55 protection ratings.

They are available in three configurations. The RMR Modular Enclosure features a freestanding design and is available with a range of door, side and top panel options. The RMR Fixed Wall-Mount Enclosure features integrated top and bottom grand plates and easy adjustment of panels or 19-inch EIA rails. The RMR Swing Wall-Mount Enclosure is designed for placing network equipment into harsh environments.

When CPI introduced the product set, senior product manager Sam Rodriguez commented, "Technology is being deployed everywhere, and the equipment is going into places it was never intended to be located. Our customers have relied on CPI to provide high-performance solutions to support their critical network infrastructure for years; so, as networks continue to expand into industrial spaces, it is only logical for us to expand our portfolio to continue offering the same level of support in these less-than-ideal locations."

A recent product introduction from Black Box echoes the sentiments of CPI's Rodriguez about technology being deployed in new places. The line of Mobile Open Racks hold "up to 1500 pounds of IT, test, diagnostic, and other electrical equipment," the company said when introducing the racks. "Engineers, developers, technicians, and designers can now clean up their desks and labs and store IT equipment neatly under their workstations. When it's time to work, users can just wheel the rack out. When done, they can wheel the rack back."

The 19-inch racks with M6 rails are designed to hold servers, network switches, power distribution units, uninterruptible power supplies, KVM switches, and other rack-mountable equipment. "The heavy-duty racks are constructed of 14-gauge steel and feature double casters, which roll smoothly over thresholds, uneven floors, carpets, and rough surfaces," Black Box said. "Users can choose from 2-post racks, which hold 1000 pounds, or 4-post racks, which hold 1500 pounds of equipment.

Joey Bernardo, Black Box infrastructure product manager, explained, "We developed these racks in house for our own use. We couldn't find any that were strong enough to stand up to daily use and abuse, so we designed our own. Because we actually use the racks, we know exactly what engineers and developers need and designed the racks to be practical, durable, and easy to roll." ◆

Patrick McLaughlin *is our chief editor.*

Sensor technology helps keep computing environments running efficiently

In data centers and other networks, sensors provide insight that enables prompt response.

BY PATRICK MCLAUGHLIN

In data centers especially, but also in other computing and networking environments, the data generated by sensors is enabling network administrators to quickly and effectively make changes to maintain or improve the efficiency of the network's operation. By producing and reporting data, sensors are foundational elements in the progression through which data becomes information, information becomes knowledge, and knowledge becomes intelligence.

The United States Department of Energy gives credence to sensors' value in data center environments through its Office of Energy Efficiency and Renewable Energy (EERE). On its website, the DoE EERE explains, "In the federal sector, agencies currently lease space from the U.S. General Services Administration (GSA) to operate more than 1400 data centers. Improving the energy performance of data centers supports progress toward meeting federally mandated greenhouse gas emission-reduction goals, while reducing costs and energy use, and allowing greater flexibility in future expansion by eliminating the need to provide additional power and cooling. Wireless sensor technology provides a cost-effective and facilities-friendly way of helping data center operators visualize and implement system changes that reduce overall energy consumption."

The EERE made these statements after evaluating a set of technology that included a network of wireless sensors, including branch power circuit monitors, temperature sensors, humidity sensors and pressure sensors, along with an integrated software product to help analyze the collected data. "The wireless sensor network provided real-time data center conditions needed to optimize energy use and achieve substantial savings, all with minimal impact on day-to-day operations."

Put to the test

The GSA's Green Proving Ground (GPG) program worked with the Energy Department's Lawrence Berkeley National Laboratory (LBNL). LBNL selected the U.S. Department of Agriculture National Information Technology Center facility in St. Louis, MO as a demonstration project location, "because its baseline conditions were representative of a well-designed, well-managed data center operated by an engaged facility staff," the EERE noted. "Sensors using a wireless mesh network and data management software to capture and graphically display real-time conditions for energy optimization were installed." It continued that the study showed "providing real-time, floor-to-ceiling information on humidity, air pressure and temperature

Within CyrusOne's Austin Data Center II, 11 of 13 computer room air handling units (shown here) originally were operating at an average fan speed of 73 percent. After implementing the Active Control feature, all 13 fans were operating at an average speed of 62 percent, which brought down power use.

EERE summarizes sensor network's benefits

Based on its experience, including what has been spelled out in this article, the United States Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) spelled out the following summary of advantages offered by wireless sensor networks.

- **Reduce Operating Expenses**—Granular temperature measurements allow optimized operations without compromising server reliability.
- **Reduce Capital Expenses**—Self-configuring wireless sensors reduce deployment cost; no wires are needed for signals or power.
- **Increase Capacity**—Extract hidden capacity by truly understanding where cooling is required.
- **Reduce Failures**—Server inlet temperature measurement provides visibility of cooling system malfunctions.

The information from EERE that is contained in this article came from the website www.energy.gov/eere. A subset of that website focuses specifically on energy efficiency in data centers. The main page for that information can be found at energy.gov/eere/femp/energy-efficiency-data-centers

conditions is feasible. This data, when combined with power use, leak detection, and equipment status, could enable data center operators to significantly improve the energy efficiency of even well-managed data centers."

The data center in the evaluation experienced a 48-percent reduction in cooling load and a 17-percent decrease in total power use, which represented an annual savings of 657 megawatt-hours. Additionally, the EERE stated, "The data center operator at the demonstration facility found that full deployment of the permanently installed wireless sensor network provides valuable real-time information needed for the ongoing optimization of data center performance. However, permanent installation of the sensor network required multiple interruptions of facility power. Recognizing this as a potentially significant barrier for some tenants, LBNL has separately piloted a smaller, portable, less-disruptive 'assessment kit' at four federally operated data centers, and found that the snapshot of real-time information it provides holds many of the full network's benefits."

The evaluation team at the LBNL "concluded that broad deployment represents a best practice that could help agencies meet mandated targets cost effectively," said the EERE. "This technology could be applied to all data centers across all agencies, regardless of climate or location … LBNL predicts that many data center rooms could benefit from this technology … Consider how much downtime your data center can tolerate before choosing between a full wireless sensor network or LBNL's 'assessment kit.'"

Cooling a colo

Examples of sensors helping to achieve data center efficiency exist outside the federal government as well. RF Code, which provides data center asset management, environmental and power-monitoring solutions, provides an example with the use of its solutions by Seattle-based colocation provider Digital Fortress. The deployment of RF Code's technology—including data center infrastructure management (DCIM) software, wireless sensors and readers—was carried out in two phases. "Phase one focused on reader installation and an initial deployment of sensors that provided coverage of Digital Fortress's most-sensitive and mission-critical areas, while phase two extended monitoring to all remaining areas throughout their facilities," RF Code recalled.

"Once all preparations had been made, the deployment process was brief," the company continued. "A single engineer was able to completely deploy and begin monitoring an 18,000-square-foot data center floor in just four hours. By Digital Fortress's estimates this process would have taken several weeks had they chosen a wired solution."

Six days after the deployment, RF Code says, it helped Digital Fortress identify a failing computer room air conditioning (CRAC) unit before it burned out. "RF Code paid for itself in the first six days," commented Scott Gamble, IT manager for Digital Fortress. "We had early warning on what we would come to learn was a failing CRAC in a high-density area of our Seattle facility. This unit slowly leaked more than 25 pounds of refrigerant over the course of 24 hours, but reported operating at 100 percent throughout the event.

"Thanks to the real-time dashboards we could see we had an emerging event, we knew where the problem was, and we knew it wasn't simply a device economizing. Better yet, we also knew the unit itself was misreporting—the panel on the device reported zero issues, but clearly something was wrong."

Subsequently RF Code extended its environmental monitoring solution to incorporate data gathered from generators, cooling towers and power infrastructure. Digital Fortress is using RF Code's R130 Dry Contact Tags, R180 4-20mA Sensors, and R120 Door Tags to

extend visibility to systems that would otherwise be costly or technically prohibitive to integrate with their management dashboards. Gamble concluded, "Using RF Code we can now apply the same tags and monitor every piece of equipment exactly the same, regardless of model or age. It's cheaper, faster and easier to use RF Code to pull and present this information than it is to try to make different equipment produce the same data in the same way."

Wireless sensors at CyrusOne

Another case-study example of sensors combined with DCIM providing efficiency and savings for a data center is CyrusOne's use of Panduit's SynapSense SynapSoft Software, which is a modular cooling platform within the company's SmartZone DCIM suite. Specifically, the Active Control feature of SynapSense brought value to CyrusOne's Austin Data Center II. Panduit explains, "Located in the Met Center business park, this 70,000-square-foot facility is the first of an optional four-phase, 288,000-square-foot data center campus. To optimize Data Hall 1 within the data center, a 20,000-square-foot facility, CyrusOne needed to monitor temperature and humidity for its customers' SLAs [service level agreements], and to conserve as much energy as possible."

The Active Control feature provides energy savings and increased efficiency by continuously aligning cooling capacity with changes in IT loads, Panduit continues. "Its granular deployment of wireless sensors measure server inlet temperature and sub-floor pressure differential to manage computer room air handler (CRAH) return temperature set points and variable fan speeds."

The Active Control feature works alongside the existing Computrols Building Automation System (CBAS). The CBAS was already wired into the facility's Stulz brand waterside economizer units and communicated via Modbus; Panduit was able to streamline the process by sending its control set points to CBAS and having CBAS pass the set points to the Stulz units. "This setup left all the existing BMS functionality in place while providing another layer of redundancy," Panduit says.

CyrusOne benefitted from a combination of SynapSense Wireless Mesh ThermaNode EZ nodes, ThermaNode EZ-H nodes, Wireless Mesh Pressure nodes, temperature sensors, CRAH nodes and Wireless Mesh Gateways.

For environmental monitoring, Panduit installed a number of sensors throughout the data center's cabinets, including temperature sensors in both the front and back as well as humidity and pressure sensors. Panduit also installed computer room air handler nodes that measure the supply and return temperatures as well as the return air's relative humidity. Specifically, Panduit employed its SynapSense Wireless Mesh ThermaNode EZ nodes (178 of them), SynapSense Wireless Mesh ThermaNode EZ-H nodes (25), SynapSense Wireless Mesh Pressure Nodes (44), temperature sensors (44), CRAH wireless mesh nodes (13) and SynapSense Wireless Mesh Gateways (3).

The company reports that before the Active Control feature was implemented, CyrusOne's Austin Data Center II operated 11 CRAH units with an average fan speed of 73 percent, all with return air temperature set points of 70 degrees Fahrenheit. The two fan units that were turned off were not sealed, and cold air from the subfloor was blowing back into the return plenum. After implementing the Active Control feature, all 13 fans were running with an average speed of 62 percent, which brought the power used down from 64.3 kw to 37.9 kw. "This is especially impressive since the 64.3 kw accounted for 11 of the 13 fans working, while the 37.9 kw is representative of Panduit turning on the two fans that were turned off, bringing the fan total to 13," Panduit points out.

"At the start of the project, the average rack inlet temperature in the data hall was 67 deg. F and the average underfloor pressure was slightly under 0.300 inches of H_20," Panduit continues. It set the target point for the rack inlet temperatures at 78 degrees and the control system increased the return air temperature set point to meet this inlet temperature, because the majority of the rack inlet temperatures were below recommended values. "Today CyrusOne is experiencing a 2- to 7-degree Fahrenheit increased in the return air temperature set points throughout the data hall," Panduit reports, "with the refrigeration power decreased to 137.4 kw from 149.9 kw. In addition, the floor pressure is perfectly balanced."

Additionally, the 11 fans that had been on previously all decreased fan speed, even though the average floor pressure in the data hall increased. The hall now has a 2- to 7-degree increase in the return air temperature set points. ◆

Patrick McLaughlin *is our chief editor.*

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PRODUCT FOCUS

WIRELESS ACCESS POINTS

Oberon's 1040 Series recess mounts

Cisco's new 2800 and 3800 series 802.11ac Wave 2 access points offer unprecedented enterprise mobile networking performance. Oberon, a Cisco Solution Partner, manufactures mounting solutions and enclosures for Cisco access points.

Oberon's new 1040 series recess mounts are designed to recess the access point partially into the ceiling, much like recessed lighting, exposing only the antenna face of the access point. This provides a secure, aesthetic, and professional installation, versus clipping the access point to the ceiling grid.

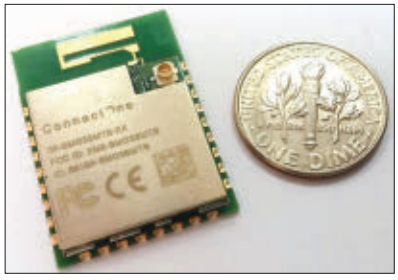
Model 1040 series styles are available for most types of ceilings, including suspended (drop) grid ceilings, cloud ceilings, hard (gyp-board) ceilings, new construction, and existing construction.

Oberon, Inc., *www.oberoninc.com*

Cloud-managed 802.11ac Wave 2 access points

Aerohive contends that its recently unveiled 802.11ac Wave 2 access points, the AP250 and AP245X (and new line of switches, the SR2208P, SR2224P, SR2324P, and SR2348P) represent the "most-adaptable wireless infrastructure available today for connected enterprises." The new products "double network capacity with [proprietary] 802.11ac Wave 2 Everywhere and Unified Wired and Wireless Cloud Management" features, added a product press release. The new cloud-managed 802.11ac Wave 2 access points feature integrated Bluetooth Low Energy (BLE) technology and are built on Aerohive's proven RF-IQ technology. RF-IQ incorporates distributed control radio intelligence, such as automated channel and power selection, load balancing, band steering, and other capabilities that enable complex radio functionality. The AP250 access point's software-selectable radios maximize customers' return on investment by allowing administrators to select transmission at 2.4GHz and 5GHz or to select dual 5GHz.

Aerohive, *www.aerohive.com*



IoT WiFi module

Connect One has introduced the first WiFi module in its next-generation family of 802.11b/g/n WiFi modules for the Internet of Things (IoT) market. The Pico WiReach IoT WiFi module offers excellent system performance for IoT connectivity when used with the Cypress BCM43362 WiFi transceiver SOC and its 802.11b/g/n MAC and baseband functionality. "Network and cloud connectivity is continuing to be a must-have ability for many applications such as medical, security, industrial control, smart grid, asset management, point of sale and the vast growing market of the Internet of Things," contends the company. "Pico WiReach continues the wireless innovation tradition at Connect One that has brought the best value, easiest-to-integrate WiFi modules to the market for over a decade." Other key features of the Pico WiReach module include: sub- $10 price in 1000+ quantity; small SMT form-factor 28 x 20 x 2.8 cm; switchable WiFi access point and WiFi client operation modes; TLS 1.2 security; WiFi enterprise security; built-in cloud connectivity; IPv4/IPv6 support (IPv6 by end of 2016); built-in sensor port for external sensors (by end of 2016); rich AT+i command set; SPI and UART interface; built-in PCB or U.FL connector antenna capabilities.

Connect One, *www.connectone.com*

EDITOR'S PICKS

News, products and trends for the communications systems industry

- 288-FIBER CABLE FOR FTTX
- STANDARD FOR TOWER CONSTRUCTION
- BICSI BOARD MEMBERS ELECTED

COMPILED BY
Matt Vincent
CIMPICKS@PENNWELL.COM

NETWORK CABLE

OFS receives TV's Emmy award for 'pioneering invention and deployment of fiber-optic cable'

OFS, a global designer, manufacturer and supplier of fiber-optic networking technology, has been honored with a Technology and Engineering Emmy Award by the National Academy of Television Arts and Sciences for contributions toward the "Pioneering Invention and Deployment of Fiber Optic Cable."

The Academy says that Emmy Awards for Technology and Engineering "are presented to companies for engineering developments so significant or innovative in nature that they materially affect the transmission, recording or reception of television."

According to a press release, "The award to OFS recognizes the unique, groundbreaking and patented fiber-optic technology inventions by Bell Labs/Western Electric (OFS predecessor companies) and OFS's role in continuing to develop game-changing technologies that have refined and enhanced the use of fiber-optic cable for broadcast television."

Dr. Timothy F. Murray, CEO and chairman of OFS, commented, "OFS is honored by this recognition of the breakthrough discoveries made by our predecessor companies, which OFS has continued to build upon with technological breakthroughs and enhancements. The invention and widespread deployment of singlemode fiber-optic cable has fundamentally changed broadcast delivery over the past 30 years."

OFS will be honored during the presentation of the 68th Annual Technology and Engineering Emmy Awards on Saturday, January 7, 2017, at The Bellagio Hotel in Las Vegas, during the week of the Consumer Electronics Show (CES).

"Today's fiber-rich broadcast networks help to enable the flawless, on-demand delivery of increasingly higher resolution television programs while also containing the bandwidth needed to deliver whatever incredible offerings the broadcast television industry will create in the future," Dr. Murray concluded. "This award is emblematic of both our company's proud heritage as well as our ongoing commitment to developing industry-leading fiber-optic innovations that positively impact the quality of life for end users around the globe." ◆

DATA CENTERS

Lenovo, Nimble Storage partner on converged data center infrastructure

Lenovo and Nimble Storage recently announced a strategic partnership "intended to transform data center capabilities by delivering new levels of efficiency and scale, and slashing the time IT teams spend managing infrastructure," as stated in a press release from the companies. Per the new partnership, Lenovo and Nimble said they will enable the use of predictive analytics in infrastructure management to automate service activities, allowing data centers to redeploy their resources from maintenance and support tasks to strategic projects that deliver value for their organizations.

"This strategic relationship with Nimble enables us to deliver a state-of-the-art all flash offering, further extending the industry's best customer experience by leveraging the predictive analytics platform, InfoSight, all while providing a lower TCO," said David Lincoln, executive director and general manager of the server, storage and solutions business unit, data center business group, Lenovo. "Through this new alliance, we are able to deliver a continuous integration of hardware, software, and analytics support, establishing the means to develop the next generation all flash data center and drive strategic value for our customers."

Lenovo plans to integrate its XClarity infrastructure management software with Nimble InfoSight, which leverages predictive analytics to automate the support experience. The two companies will work together to create "self-healing" system management capabilities across the entire data center infrastructure, including storage, compute, and networking. The alliance promises to increase data center resiliency through early problem identification and automated intervention across the infrastructure stack. The result is expected to provide IT professionals the opportunity to redeploy resources from day-to-day maintenance tasks to strategic revenue-generating projects that will create value and drive business growth.

As noted by the companies: "According to recent data from industry analyst firm, Forrester, for 2016, U.S. enterprises are allocating only 29 percent of their tech budgets to new project spending and 45 percent of the balance to ongoing operations and maintenance, keeping the lights on, and maintaining the status quo. This partnership brings together Lenovo's world-class server technology, rated number one in reliability and customer satisfaction, with Nimble's innovative All Flash storage offerings and InfoSight Predictive Analytics as a means to address this issue, enabling the IT professional to spend less time on maintenance and more time innovating. In the first wave of these offerings, Lenovo today announced its ThinkAgile CX series of converged infrastructure solutions, which has storage capabilities powered by Nimble Predictive All Flash arrays."

"Immediate data access is critical to maintaining competitive edge. Unfortunately, enterprises continue to be challenged with complex infrastructure that causes applications to slow down and impact business. We strive to provide simple, self-managing infrastructure so IT organizations can steer their attention to strategic business initiatives," commented Suresh Vasudevan, chief executive officer, Nimble Storage. "By combining our innovative technology with Lenovo's global footprint and product scope we'll provide a portfolio of high performance, application optimized solutions that minimize infrastructure management and lower overall support costs."

The first offerings that will benefit from the Lenovo-Nimble partnership will be the ThinkAgile CX Series solution. ◆

NETWORK CABLE

288-fiber cable for FTTx is 10.4 millimeters in diameter

Datwyler Cabling Solutions recently added a fiber cable with 288 singlemode fibers (G.652.D) to its FO Outdoor wbKT S-Micro fiber-optic cable family. The 12x24 stranded loose tube cable is ideally suited for fiber-to-the-x (FTTx) networks. It is 10.4 millimeters in diameter.

"This is an ideal size for blowing into microducts of 12 mm or more internal diameter," the company said.

"The compact, non-metallic cable with its dry interstices makes for a design which is easy to install and remove," Datwyler continued. "Users also benefit from its outstanding attenuation figures—0.21 dB/km at 1550 nm, for example—and good mechanical properties which are reflected in an increased tensile strength (2900 N) and very long blowing distances."

Datwyler Cabling Solutions is an internationally operating supplier of products, system solutions and services for electrical and communications infrastructures. ◆

IP CONVERGENCE

Eaton, EPRI field test intelligent circuit breakers for smart grids, utilities

The Electric Power Research Institute (EPRI) and power management company Eaton have announced a collaborative demonstration fielded by EPRI with utility providers across the United States to test a new Eaton circuit breaker designed to improve utility service reliability and optimize the grid.

EPRI will test and evaluate the impact of Eaton's energy management circuit breaker (EMCB) in the field, and the data from the testing will be provided to the participating utilities. The research results are anticipated to help participants better understand how to manage demand for electricity with the potential for more effective integration of new energy sources onto the grid, while also enabling homeowners to strategically manage their energy use.

The field test will involve the installation of EMCBs by 12 utilities in approximately 500 homes across the country. EPRI will evaluate and analyze field test data as part of this collaborative research and development project with utilities, including American Electric Power, CenterPoint Energy, Dairyland Power Cooperative, Duke Energy, Exelon subsidiaries ComEd and Pepco, Nebraska Public Power District, Seattle City Light, Southern Company, and Tri-State Generation and Transmission Association, Inc.

"The EMCB technology puts some of the benefits of a smart, integrated grid in the hands of homeowners, and could transform the way consumers interact with electricity," said Arshad Mansoor, EPRI senior vice president for research and development. "This field test also provides a real-time, in-home assessment of how the EMCB can improve utility service and optimize the grid by supporting demand response, distributed energy resources, solar installation monitoring, energy storage, and energy management."

The EMCB combines circuit breaker technology, which provides circuit protection in the customer's load center, with Internet connectivity and on-board intelligence. The EMCB makes a home's circuits "smart" and provides better energy use information for residential energy management and for utility optimization of grid reliability. The devices can be used in new installations or retrofitted into existing home electrical panels without additional hardware.

"Eaton engineers reimagined fundamental power management technology, including the circuit breaker, to help utilities and consumers more actively and intelligently manage power," said Joanne Edwards, senior vice president and general manager, residential and wiring devices division at Eaton. "The field test will help us accelerate the development of the energy management circuit breaker, while also providing data on device lifecycle management, over-the-air firmware updates, and communication architectures that can be applied across our solutions for residential and utility customers."

The device combines Eaton's miniature circuit breaker technology with secure WiFi communications, utility-grade metering, and load control to help support grid optimization. The Eaton circuit breakers also leverage the simple-to-install and maintain Internet of Things connectivity platform from Electric Imp. Eaton collaborated with Electric Imp, co-founded by Hugo Fiennes, to ensure the EMCBs and their managed services are secure, flexible, reliable, and scalable. ◆

INDUSTRY UPDATE

IWCS and UL to produce regional cable, connectivity technology conference in Shanghai, China

IWCS, producer of the International Cable & Connectivity Symposium, welcomed attendees to its 65th annual conference in Providence, RI, from October 2-5, 2016.

A formal announcement of a collaboration between IWCS and UL to produce a regional conference in Shanghai, China next year was made at the event's plenary session. Robert Wessels, Jr. of CommScope and chairman of IWCS, signed the collaboration agreement with L.F. Lai, VP and general manager of UL's Wire and Cable division. The new event, dubbed the "UL and IWCS China 2017 Cable & Connectivity Symposium", will be held April 25-27, 2017 at the Marriott Shanghai City Centre, and will be based on the IWCS conference format of a technical symposium, plenary session with keynote speaker, executive track, and a professional development program. Simultaneous translations will be provided for each presentation. Selection of presentations will be made with a call for papers and peer review.

"This is our 65th year of the global symposium conducted in the United States and we are now looking forward to presenting topics to a broader audience in Asia, particularly to those who cannot travel to the U.S.," commented CommScope's Wessels. L.F. Lai, VP and general manager of UL's Wire and Cable division added, "As China is the largest market for wire and cable connectivity with the

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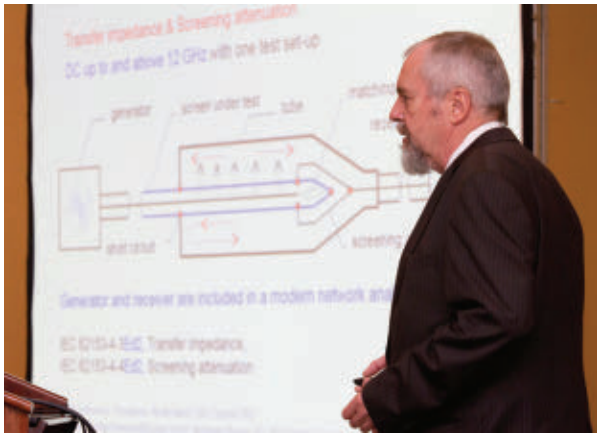
strongest need for acquiring the knowledge of latest innovations, it is logical to establish this regional event in China as the premier venue to learn of new technologies in cable and connectivity materials, products, processes and applications."

Formal topics for this year's IWCS 2016 in Providence included: the Internet of Things (IoT); Power over Communications Cables; Global FTTx and Installation; Materials for Cable and Connectivity Applications; Fiber Optic Connectors for Harsh Environments; Copper Cable Performance and Design.

The event's executive session and the technical symposium offered a program containing 99 technical papers and presentations in 16 sessions that attracted presenters and attendees from across the U.S., Asia, and Europe. The conference also included 22 poster papers, 11 new product presentations, 7 professional development courses led by industry experts, and a 2-day supplier exhibition.

Attendees came from 25 countries, spanning 6 continents, with 31 percent from outside the U.S. Attendees from Europe accounted for 13 percent, while 14 percent came from Asia. Eleven percent of the Attendees were from Japan and China. Overall attendance increased 24 percent over the prior year.

"This conference gives attendees a unique opportunity to gain insight from top engineers, researchers and executives from the cabling and connectivity industry," said David B. Kiddoo, CEO of IWCS. "The quality of the papers was excellent and the overall popularity of the topics, including the enhanced connectivity focus, generated a high level of global interest in this year's program."



A highlight of the 2016 IWCS plenary session was the recognition for the best papers and presenters of the prior year. Award winners were as follows.

- The Jack Spergel Memorial Award for Outstanding Technical Paper for "Characterization of Modal Dependence of MMF Chromatic Dispersion for Wideband MMF" was presented to co-authors Bulent Kose; Jose Castro, Ph.D.; Rick Pimpinella, Ph.D.; Yu Huang, Ph.D.; Alexander Berian; Asher Novick and Brett Lane, Ph.D.; all of Panduit Corporation, Tinley Park, IL, USA.
- The Outstanding Poster Paper for "Development of 2000-Fiber Ultra-High Density Underground Optical Cable" was presented to its authors Tomohiro Ishimura, Masayoshi Tsukamoto and Yutaka Hoshino of Furukawa Electric Co., Ltd., Mie, Japan.
- The Kitts-Kingsley Award for Best Presentation was given to David Mazzarese, Ph.D. of OFS, Norcross, GA, USA, for "Splice Loss Criteria for Outside Plant Cable."

Ian Greveling of Corning Optical Communications LLC, North Carolina, USA, a retiring member of the IWCS Board of Directors, and retiring Symposium Committee Member Paolo Marelli, of Prysmian Group, Milano, Italy, were also honored.

New Symposium Committee members added in 2016 included Eduardo Garza, Hitachi Cable America; Richard Mack, CRU; James Malkemus, General Cable; Dr. Akira Murata, Fujikura, Ltd.; Wayne Kachmar, Technical Horsepower Consulting, LLC; Robert LaRocca, Underwriters Laboratories, LLC; Simone (Cy) Genna, The Chemours Company; and Durgesh S. Vaidya, OFS, a Furukawa Company.

Seven recipients of the student scholarship awards for the 2016/2017 academic year were also acknowledged at the plenary session. Contributions came from Cable Components Group, the Wire and Cable Industry Suppliers Association (WCISA), The Christopher Kenneth Eoll Memorial Endowment, and the Wire Association International (WAI).

The event's two-day supplier exhibition featured more than 100 suppliers to the cable and connectivity industry. ◆

STANDARDS

New TIA standard addresses wireless tower planning and construction

The Telecommunications Industry Association (TIA) released a new standard to facilitate improved communication between engineers and contractors planning and assessing wireless tower construction. The standard—*ANSI/TIA-322 Loading Criteria, Analysis, and Design Related to the Installation, Alteration and Maintenance of Communication Structures*—became available on August 31. It revises and redacts TIA's 1019-A standard (Standard for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas), which was published in 2012.

Through a coordinated effort, TIA and the American Society of Safety Engineers (ASSE) evolved the original TIA-1019-A standard for two distinct audiences in construction planning and implementation. Portions of TIA-1019-A were brought into the existing standardization efforts underway in ASSE and drove the completion of the ANSI/ASSE A10.48 standard.

Scott Belcher, chief executive officer of the TIA, said, "I am extremely proud of the way our member volunteers worked together to develop and release this standard in less than a year. The revisions have been anticipated for over a decade, so it was due to extraordinary work and focus by TIA's TR-14 Engineering Committee to step up and move this forward."

The ANSI/TIA-322 standard addresses construction-related loading, analysis and design requirements while the ANSI/ASSE A10.48 standard addresses construction means and methods. The development of both of these standards as a collective revision to TIA-1019-A was a joint effort between TIA and ASSE to ensure the standards are synchronized, the TIA explained when it announced the availability of TIA-322. TIA-322 and ASSE A10.48 "each represent important roles required to complete the planning and construction process," the TIA added. Both standards go into effect January 1, 2017.

James Ruedlinger, chair of the task group that developed ANSI/TIA-322, commented, "I would like to extend my utmost gratitude to all TIA members who served on the TR-14 Task Group 7 responsible for the ANSI/TIA-322. Tremendous time and effort has been expended to produce this industry-leading standard as it relates to loading, analysis, and design of communication structures under construction as well as specialized design criteria for tower lifting devices. I would also like to sincerely thank my mentor, colleague, and dear friend Ernie Jones for his vision, integrity, and passion, which served as the stimulus in the formation and ongoing development for this standard to promote construction awareness for the entire communications industry."

The TIA actively seeks participation in tower industry projects from the user and general-interest communities. More information about TIA TR-14 and participation in standards development with TIA is available from Marianna Kramarikova: mkramarikova@tiaonline.org. ◆

TRAINING

ETA, IWCE offer veteran, student scholarships for wireless communications training

One deserving U.S. military veteran and one student will each earn a scholarship to attend Electronics Technicians Association, (ETA) International's Education Forum 2017 (EF17) and Penton's International Wireless Communications Expo (IWCE), co-locating March 27-31, 2017 at the Las Vegas Convention Center in Las Vegas, NV. Students and honorably discharged U.S. military veterans interested in technical careers in the wireless communications field are encouraged to submit an essay for a scholarship to attend EF17@IWCE. Winners will have the opportunity to meet industry leaders and recruiters at the expo's Job Education and Training Center, featuring more than 350 wireless companies.

According to a press release, the student scholarship

essay contest includes one short course package conference pass ($549 value), one coach class plane ticket to Las Vegas, NV (value up to $400), two nights' hotel stay at IWCE's host hotel (approximate value of $400), access to IWCE's exhibit hall and recognition during ETA's annual award banquet.

Last year's student winner was Kelly Krenek from A&M Consolidated High School, College Station, TX. Although her focus was on information technology, after the EF16@IWCE experience, she now plans to concentrate her continued education on networking and wireless communication. "While I entered the conference with the intention to become a systems engineer, I've now discovered even more opportunities and careers I could choose from within wireless communications," Krenek said.

To be eligible, the student must have at least a 2.5 grade point average and must be currently enrolled in a school or other technical training program. This essay must describe the student's ideal career in wireless communications, how this scholarship could benefit their future personally and professionally, as well as why they should be considered for this scholarship.

Honorably discharged veterans with an FCC Amateur Radio License or those with a strong communications background are encouraged to apply for the Veteran Scholarship. It includes one seat in the event's Radio Frequency Interference Mitigation hands-on training workshop conducted by Ira Wiesenfeld, P.E., of IWA Technical Services, Inc., along with ETA's RFIM certification test, a $949 total value.

The veteran scholarship also includes five nights hotel stay (room charge and tax) at IWCE's host hotel; one Short Course Package conference pass to IWCE, a $549 value; one coach class plane ticket to Las Vegas, Nevada, value up to $400; access to the expo's Job Training & Education Center along with IWCE's two-day exhibit hall and recognition during ETA's annual award banquet.

Last year's veteran co-winners were Brian C. Anderson, CET, and Marcus Irvine, CETsr, both from Veteran's Assembled Electronics (VAE) of Florida. "Brian and Marcus both attended IWATSI's Line and Antenna Sweep workshop to earn certification and gain critical knowledge with hands-on skills to launch successful civilian careers," said VAE CEO John Shepard.

Students and veterans interested in applying must submit a 1,000-word-or-less essay, along with a recent resume, cover letter and picture no later than January 9, 2017 to ETA at eta@eta-i.org. ◆

WIRELESS

Wilson Electronics positions cellular signal dual-booster system as DAS alternative

At CEDIA 2016 (September 6-9), Wilson Electronics debuted its WilsonPro 1000/1050 cellular signal booster system. The company contends that "this new product line solidifies WilsonPro as an innovative, smart alternative to expensive DAS rollouts, accomplishing the same objectives of better cellular service with less work and lower costs."

According to a product press release, "Wilson Electronics' team of engineers designed the WilsonPro 1000/1050 to address the issue of reduced system performance due to the loss of cell signals over unavoidable, long coax cable lines, a common issue in large buildings. The [unit's] two-booster design, [comprising] a main booster and inline booster, provides up to 32x stronger signal in offices and large buildings, ensuring maximum indoor coverage, faster download and upload speeds, and no more dropped calls. The system's dual-booster design consists of four parts—two boosters and two antennas—that work together to provide exceptional mobile connectivity. Unlike most single booster designs, WilsonPro 1000/1050 boosters communicate with one another to mitigate signal loss, so those in the building can enjoy maximum indoor coverage."

"Our two-unit system of the WilsonPro 1000 in combination with the WilsonPro 1050 is the industry's first 'intelligent' system. It enhances all cellular signals simultaneously while greatly extending the reach in a large building where cable loss would otherwise negate the system performance of a standard booster," explains Jeff Gudewicz, vice president, corporate development at Wilson Electronics. "This technology allows these units to communicate over the same coax used to pass RF frequencies, giving installers an option for delivering reliable connectivity without adding complexity of cabling and installation."

As for how the system works specifically, Gudewicz adds, "The WilsonPro 1000, the main booster, amplifies the cell signal, and the 1050, the supplementary inline booster, restores any signal lost. An indoor antenna communicates with cellular devices inside the space, and an outdoor antenna communicates with the cell tower. While the WilsonPro 1050 relies on the 1000 to function, the 1000 does work as a standalone booster. The WilsonPro 1000 and 1000/1050 are independently tested and carrier-agnostic, providing coverage through every corner and level of large buildings for all U.S. and Canadian phone carriers, including 4G LTE enabled devices."

The WilsonPro 1000/1050 system is expected to be available for purchase through WilsonPro certified resellers this December. ◆

DATA CENTERS

Fuji Electric launches next-generation UPS line for NA data center market

Fuji Electric Corp. of America has launched the next generation of the company's UPS system for the North American data center market.

The new UPS7300WX-T3U features "an innovative transformer-less UPS designed to withstand the specific load and environmental conditions of data centers as well as other commercial applications, utilizing Fuji Electric's patented RB-IGBT technology and AT-NPC 3-Level circuit topology to deliver up to 97.5 percent efficiency and unparalleled reliability," says the company. The series is billed as the company's most scalable UPS system to date, with an expandable architecture that delivers any size unit from 225-1000kW using 330kVA modules.

"Our engineering team recognized that data centers value scalability in their equipment, particularly the UPS systems, so that their infrastructure can grow with them," said Phil Charatz, president and CEO of Fuji Electric Corp. of America. "The UPS7300WX-T3U series offers this flexibility, along with other key features such as a high efficiency (HE) mode and the use of advanced materials contributing to the unit's durability and efficiency."

The UPS7300WX-T3U series will be rolled out in phases beginning in January 2017, followed by additional product releases in July 2017 and December 2017. The IGBTs used in the UPS7300WX-T3U unit were specifically designed for use in commercial applications, and incorporate silicon carbide (SiC) in the areas within the device that incur the most stress, notes Fuji.

The systems rely on DC-DC converters for battery longevity and offer a selectable HE mode for superior efficiency when power conditioning is not required, thereby increasing the efficiency to as high as 99 percent under normal conditions. Redundant fans come standard with all UPS7300WX-T3U models; the units are fully maintainable and repairable with only front access required.

"Data centers have become more advanced and complex in recent years, and it's critical that the equipment supporting these facilities be held to the highest standards in terms of quality and reliability," added Charatz. "Fuji Electric has been manufacturing power electronics products for nearly a century, so our customers can rest assured that our UPS systems will offer them the protection they need when it counts the most." ◆

INSTALLATION

GC&E Systems tasked for phone system, cable plant operations and maintenance at US Military Academy at West Point, NY

GC&E Systems Group, Inc. announced its successful pursuit of an IMCS III task order at the US Military Academy (USMA) at West Point, NY.

The task order is to provide operations and maintenance (O&M) of the administrative telephone system (ATS) and cable plant at the West Point USAG and Keller Army Hospital with a period of performance of five years including a one-year base contract and four one-year options.

The USMA at West Point, NY is a historic and prestigious garrison that has played a major part in shaping the United States. GC&E will be supporting the Network Enterprise Center (NEC), which operates as a subordinate element of the 7th Signal Command, part of the Army's Network Enterprise Technology Command (NETCOM).

Founded in 1999 and with more than 200 employees, GC&E is a veteran-owned small business based in Norcross, GA, specializing in information assurance, information technology, telecommunications, and electronic security solutions for federal, state, and commercial markets.

In making the announcement, GC&E's owner and chief executive officer, Dan O'Sullivan stated, "GC&E Systems Group is honored to be awarded this task order to support the USMA at West Point under the IMCS III contract vehicle. We look forward to contributing to the success of the mission at such an important part of our nation's history, West Point." ◆

WIRELESS

CommScope launches Ultra-Wideband antennas for new wireless spectrum

CommScope announced that it is ready to support the next generation of wireless networks in Europe and the US with base station antennas upgraded for the latest spectrum. The company has introduced new Ultra-Wideband antennas that support the 1400 MHz and 600 MHz frequency bands, the latest spectrum being released for cellular network use. CommScope says it has already delivered the Ultra-Wideband antenna for 1400 MHz to a major European operator.

"Speed to market is a critical success factor for network operators in today's competitive wireless industry," said Upendra Pingle, vice president, base station antennas, CommScope. "CommScope prides itself on responding to real market demand quickly, ready to help our wireless customers deploy their valuable spectrum holdings as rapidly as possible."

To keep up with ever-growing data demand, CommScope notes that wireless operators are adding new spectrum to their networks to increase capacity. One recent report cited by the company suggests that streaming audio and video content will account for 80 percent of network traffic by 2020. More than 20 billion Internet of Things devices could also be connected by then.

Further, many European network operators recently received licenses to operate in the 1400-MHz bands, which will help supplement downlink speeds and improve the user experience. CommScope's Ultra-Wideband antenna covers the full spectrum of 1427 to 2690 MHz. Uniquely, the new antenna has separate inputs for the 1400-MHz band, enabling downtilt for just that band, while still offering 4x2 and 4x4 MIMO capability on the 1800-, 2100-, 2300- and 2600-MHz bands without increasing the size of the antenna.

For the US market, CommScope has an Ultra-Wideband antenna ready for the 600-MHz bands currently being auctioned, which could serve as a "wide-area 5G coverage layer." CommScope says its 600-MHz Ultra-Wideband antenna offers superior narrow beamwidth performance, giving it excellent pattern containment, roll off and sector overlap control. These pattern characteristics reduce interference, boost network capacity and enable operators to get the most from their spectral investments. CommScope expects to begin trials of the 600-MHz Ultra-Wideband antennas before year's end.

In addition to supporting new spectrum, CommScope's Ultra-Wideband antennas carry the major frequency bands used globally, enabling operators to provide a variety of services from the same antennas. Network operators typically need such multifaceted network equipment in order to support the numerous wireless technologies and devices in use today. ◆

STANDARDS

BICSI members elect six to board of directors

In balloting that ended September 30, BICSI members elected six individuals to serve on the association's board of directors for two-year terms beginning in January 2017.

"Congratulations to these newly elected individuals," said BICSI president Brian Ensign, RCDD, NTS, OSP, RTPM, CSI. "Volunteering with BICSI is a rewarding experience, and a perfect chance to make sure your voice is heard. The rest of the board and I look forward to working with these incoming board members to continue to ensure the prosperity of our great organization."

The new officers will officially be inaugurated on January 24, 2017.

The newly elected board members are as follows:

- *Secretary*—Carol Everett Oliver, RCDD, ESS; Legrand North America (Cape Coral, FL)
- *Canadian Region Director*—Greg Porter, RCDD; Sales Outsource Solutions (Schomberg, ON)
- *Global Region Director*—Honorico "Rick" Ciordia, RCDD, DCDC, RTPM, CT, PE; ETTG (Bayamon, Puerto Rico)
- *U.S. South-Central Region Director*—Todd W. Taylor, RCDD, NTS, OSP; Enfinity Engineering, LLC (Brentwood, TN)
- *U.S. Southeast Region Director*—Mel Lesperance, RCDD; Lakeside Consulting (Tampa, FL)
- *U.S. Western Region Director*—Pat McMurray, RCDD, DCDC, NTS, OSP; T&R Communications Inc. (Sacramento, CA) ◆

NETWORK CABLE

R&M launches antibacterial hospital cabling line

In India, R&M has launched a special cabling line for health institutions. The R&MhealthLine range is suitable for patient rooms and similar deployment areas that have an inherent risk of infection. The new outlets and patch cords have antibacterial properties. Their plastic parts are resistant to germs and bacteria in compliance with ISO 22196.

The company says its R&MhealthLine offers "the first consistent and complete range for network equipment in environments reserved for patients and people requiring care. It comprises outlets with RJ45 sockets, shielded and unshielded patch cords for connecting computers, multimedia, communication and medical devices, as well as shutters and coding elements from the R&M security system. R&MhealthLine products are just as easy to install and operate as standard products. They are compatible with the modular cabling system R&Mfreenet that covers all areas of structured building cabling."

Medical devices and data networks have to be galvanically isolated at such places of use to protect patients from any possible over voltages, R&M further explained. The company has developed a solution for this, too: the maintenance-free R&MsafeLine network isolation module. It can be installed in existing LAN outlets and takes care of galvanic isolation. The company says that this property saves on costly alternative solutions in terms of medical technology and ensures uninterrupted data transmission. The company adds that the R&MsafeLine range is not dependent on a particular device, does not require any software or its own power supply, and is compatible with the cabling system R&Mfreenet.

Further, clinics have to ensure that the operation of medical, administrative and multimedia applications are clearly separated. The R&M security system supports this goal with color coding, shutters and labels to mark the different connections. The highest level of the security system prevents misuse or errors when cables are unplugged or plugged in through mechanical locks for LAN connectors. Only authorized people can open the locks. This means clinics can take physical steps to ensure that data connections are not interrupted unintentionally or negligently.

"According to the World Health Organization around 16 million people die every year from infections contracted in hospitals. We want to make a contribution to reducing the risk of infection," concludes Matthias Gerber, R&M market manager, LAN cabling. "With the installation of R&MhealthLine, clinics can further improve their risk management in the IT area." ◆

MERGERS AND ACQUISITIONS

EXFO acquires RF test technology

EXFO recently acquired the majority of the assets of Absolute Analysis, Inc., a privately held company in Newbury Park, CA. The $8.25-million cash-and-stock deal includes technology, expertise and solutions in the area of radio frequency (RF) testing for fiber-based radio access networks (RANs).

"This acquisition is driven by EXFO's commitment to provide market-leading solutions to mobile network operators [MNOs] in their quest to deploy next-generation, fiber-based fronthaul networks and RAN architectures," EXFO said. "In a market where subscriber quality of experience is a profitability game-changer, MNOs have little room for error while pressure is increasing to deploy faster and minimize operating expenses."

Absolute Analysis's solutions "are critical for identifying and analyzing RF interference issues in fiber-to-the-antenna [FTTA], distributed antenna system [DAS], remote radio heads [RRHs] and baseband units [BBUs] that support 4G/LTE and, soon, 5G wireless mobility and Internet of Things [IoT]," EXFO continued. "Absolute Analysis's technology delivers highly efficient Common Public Radio Interface protocol analysis and emulation as well as RF-over-CPRI spectrum analysis."

The company said it will combine its optical and Ethernet test technologies with the newly acquired technologies, describing the new capabilities as "a unique combination of RF analysis-over-CPRI with market-leading fiber and Ethernet test technologies," saying this combination "significantly accelerates service delivery and troubleshooting, which reduces operating expenses for MNOs."

Some of Absolute Analysis's technology already has been integrated into a portion of EXFO's recently launched Optical RF application for its FTB-1 Pro test platform.

Germain Lamonde, EXFO's chairman, president and CEO, said, "Mobile network operators are transforming their architectures and deploying fiber deeper into radio access networks to add new services and much-needed capacity, while preparing for 5G mobility and IoT.

"This small, synergistic and strategic acquisition allows EXFO to strengthen its leadership position with a unique, all-in-one optical, Ethernet and RF test solution to help MNOs greatly enhance their productivity and network reliability." ◆

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WIRELESS

Aerohive Networks unveils Software Defined LAN (SD-LAN) platform

Aerohive Networks announced that it is launching a comprehensive solution for the Software Defined LAN (SD-LAN). "Redefining the access layer with flexible wireless and wired networking capabilities, SD-LAN is a new architecture for access networks designed for organizations struggling to adapt their network to the constantly changing demands of mobility and their business. Aerohive is leading the shift to SD-LAN in the enterprise and is the first to deliver solutions for this new architecture," began a company statement announcing the platform launch.

Aerohive's SD-LAN capabilities include a new line of cloud-managed access switches; the AP250, a Wave 2 802.11ac access point with software-definable dual-5-GHz radios; the latest release of the company's HiveManager NG cloud-delivered network and policy management; dynamic application and identity-driven network performance; and an open API platform. "All of this makes Aerohive the first to deliver software defined access for adaptable, flexible, and cost-effective wireless and wired access networking," claims the company.

Aerohive says its SD-LAN platform defines the following five key attributes for dynamic next-generation access networks.

Application optimized—Prioritizes and dynamically changes the performance and behavior of the network based on the applications that use the network, focusing network resources where they best serve the organization's most important activities.

Identity driven—Dynamically defines what individual users, clients, and things can do when they access the SD-LAN. Secure granular context based access policies that can be applied to just one user and device or groups of users and devices.

Adaptable wired and WiFi access layer—Wireless access points and access switches that can intelligently respond as changes in network configuration and requirements occur. This includes control protocols to deliver self-optimization, self-healing, and device behavior that can be manipulated through software.

Cloud managed—Centralized management of operations and policies, with policy changes distributed in real-time to switches and access points, across the distributed access network infrastructure. Cloud management keeps networks dynamic, tightly managed, and cost effective to operate.

Open APIs—Programmable interfaces that allow tight integration of network and applications infrastructures, enabling the network to provide new insights and integrate with the rest of the operations framework.

The platform introduction statement concluded, "Modern networks must continuously adjust and adapt to keep up with the pace of change that mobility has created, something unachievable in traditional network architectures. SD-LAN builds on the principles of software-defined networks (SDN) in the data center and the software-defined WAN (SD-WAN) to create a new approach to adaptable, flexible, and cost-effective wireless and wired access network. This builds an application- and policy-driven architecture, unchaining hardware and software layers while offering self-organizing and centrally managed networks that are simpler to operate, integrate, and scale." ◆

FIBER INSPECTION

Fiber-optic video scope configured for Windows OS

The RMS-1 TruVue Fiber Optic Video Scope is now configured for Windows 7, Windows 8 and Windows 10, its inventor Edward J. Forrest recently announced. RMS-1 is direct digital photography and records in still and motion imagery.

"The RMS-1 is the only device that can 'see' beyond the customary and limited field-of-view as noted in IEC-61300-3-35," Forrest explained. "This is an important advance as debris present in many sectors of the fiber-optic connector, heretofore not possible to be seen, can contribute to reflectance and insertion loss. The instrument can be used for field service, production lines, and a very essential asset for training applications."

Forrest also noted, "Professional trainers, production lines, central office/data center operations will be essentially interested as the instrument clearly expresses the need to clean and inspect as well as where, which answers why." ◆

NETWORK CABLE

Berk-Tek provides Environmental and Health Product Declarations on category cabling

Berk-Tek, a Nexans company, announced that it has obtained Environmental and Health Product Declarations (EPD and HPD) on its category cabling products. EPDs and HPDs help companies reach sustainable building objectives and obtain points towards Leadership in Energy and Environmental Design (LEED) certification.

EPDs are third-party verified and registered documents that communicate transparent and comparable information about the lifecycle environmental impact of products. Berk-Tek has published its environmental declarations through the PEPecopassport program developed by the PEP Association, an industry-wide recognized non-profit organization that provides environmental declarations specifically for the electrical and electronics industries.

"PEPs are product-specific EPDs, so they are valued as one full product towards LEED credit achievement, versus a non-specific EPD, which only counts as half of one product," stated Brian Simmons, copper product manager for Berk-Tek.

In addition, Berk-Tek's HPDs are developed with the Health Product Declaration Open Standard to accurately disclose their content and health information in compliance with the LEED program. Use of Berk-Tek's copper cabling on a project can count towards up to two points towards LEED credits.

"We understand that these certifications are very important to customers working towards LEED certification," added Simmons. "But more than that, we are committed to doing our part to help preserve and protect our environment."

This new announcement was made in conjunction with the release of Berk-Tek's enhanced EVERYTHING IP platform, which features product enhancements and several new technical resources. ◆

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REPRINTS
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ISRAEL
Dan Aronovic
+972 9 899 5813
aronovic@actcom.co.il

ASIA
Adonis Mak
+852 2 838 6298; Fax: +852 2 838 2766
adonism@actintl.com.hk

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Masaki Mori
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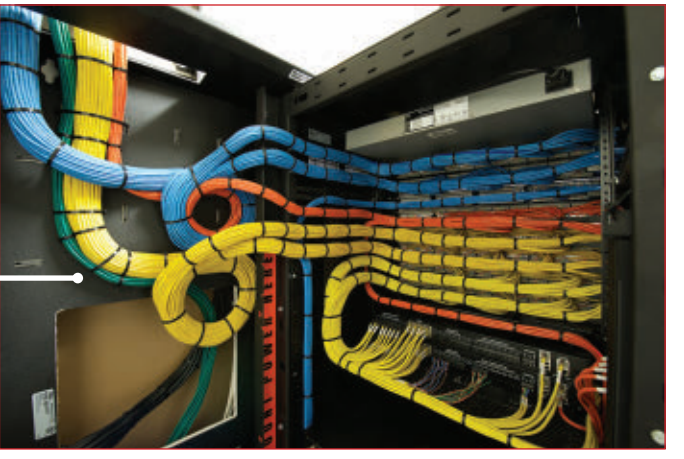
INFRASTRUCTURE INSIGHTS

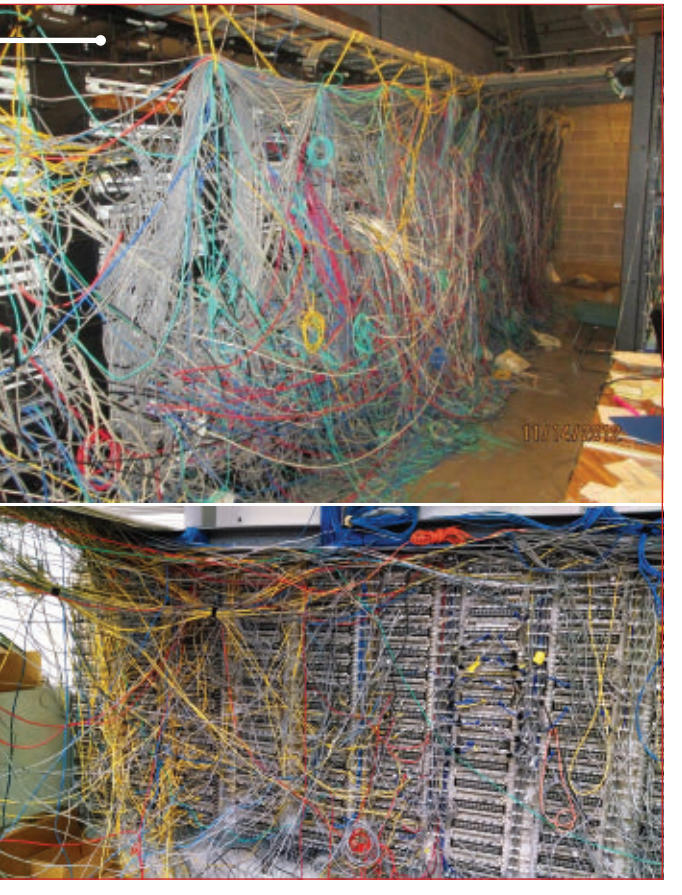
Cabling exceptionalism: Order vs. chaos



Fancy Outfit:
This photo garnered the 'Best Dressed System' award at the CEDIA 2016 show, which was held September 13-17. This award-winning installation was created by Admit One Home Systems, Inc. of Edina, MN.

As stated by the firm's website, Admit One is focused on providing "real-world solutions for high-end audio/video projects for homeowners and builders." Brands sold by the firm include: Acoustic Innovations, Adcom, Berkline, Epson, Faroudja, Fujitsu, Hitachi, InFocus, Integra, JVC, James Loudspkrs, Krell, Kaleidescape, NAD, Niles, Panasonic, Parasound, RTI, Samsung, Sharp, SpeakerCraft, Stewart, Toshiba, Vidikron, and Vutec.

Billed as an international trade association representing 3,700 member companies worldwide and serving more than 30,000 industry professionals who manufacture, design, and integrate goods and services for the connected home, CEDIA cites itself as "the leading global authority in the $14-billion home technology industry."



Total Disaster?
From M.B., a BICSI ICT-certified cabling installer from the U.S. southeastern region and senior communications engineer specializing in switch and wiring infrastructure for small-to-medium enterprises, comes this breathtaking double shot of cabling disaster writ large, as found at separate job sites, no less.

"Cabling chaos," was the only caption provided, and probably the only one needed.

The paintings of Jackson Pollock leap immediately to mind—but he did those on purpose.

Conversely, in terms of causation, these images seem to evoke the "First Law of Holes" (or "Law of Holes"), an adage which states, per Wikipedia's definition, that "if you find yourself in a hole, stop digging." The past installers here did clearly the opposite.

Send your Must-See Cabling Photos to mattv@pennwell.com ◆

Matt Vincent, Senior Editor
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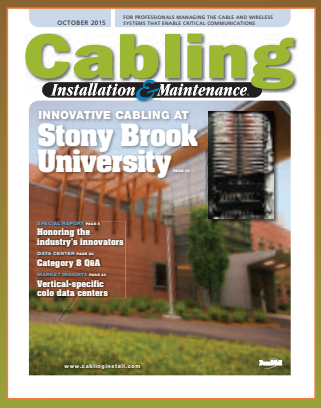

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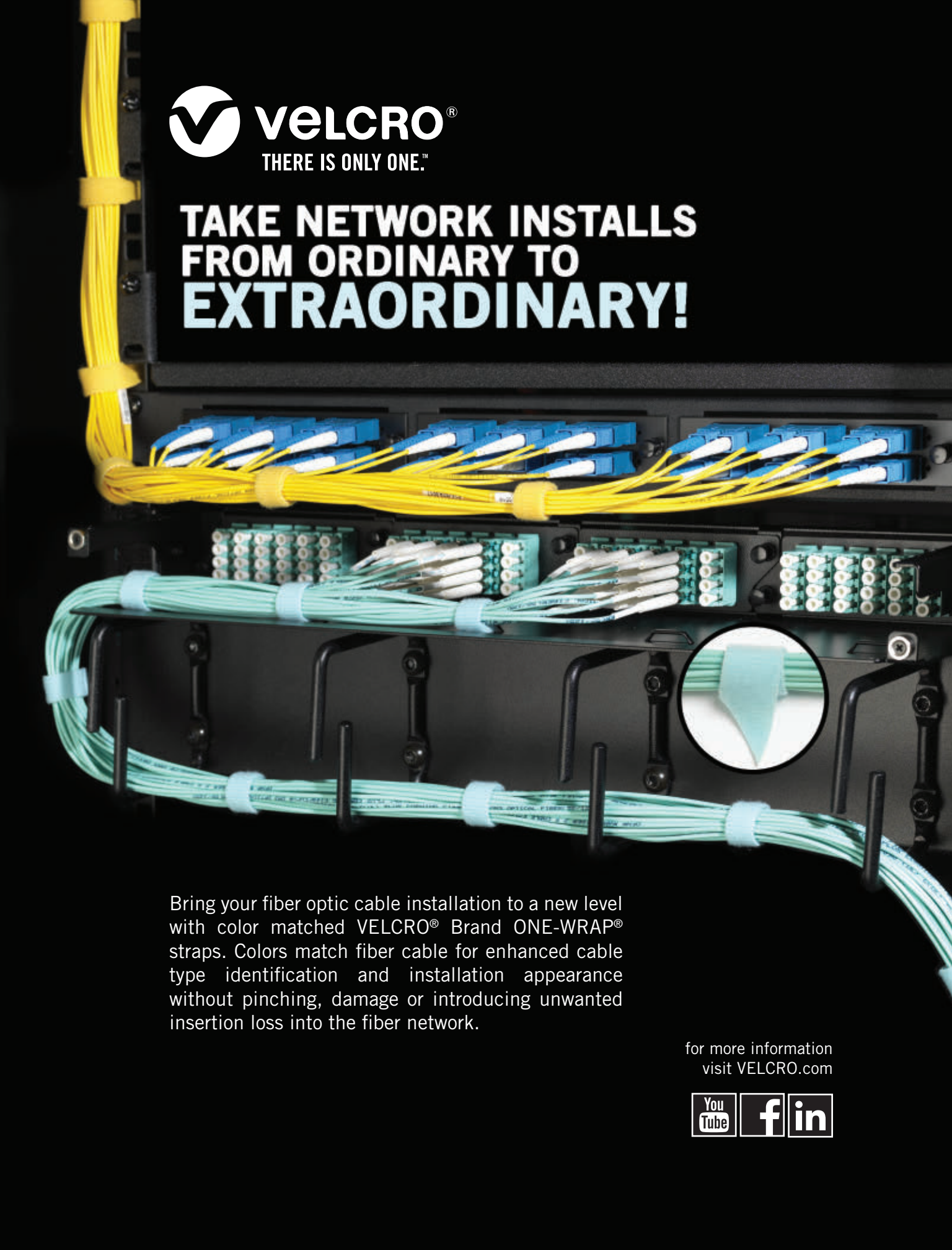
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